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ORIGINAL ARTICLE

Level of training in autistic spectrum disorders among hospital paediatricians☆

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Abstract
Background: Training in autistic spectrum disorders is crucial in order to achieve an early diagnosis. However, the number of papers describing this training is limited. This study describes the level of knowledge among paediatricians from tertiary care hospitals in different regions of Spain and detects areas that need improvement.
Material and method: A total of one hundred and fifty-seven (157) paediatricians working in tertiary healthcare hospitals located in three different regions in Spain consented to complete an online questionnaire divided in three sections (socio-demographic, knowledge about childhood autism, and opinion). Data were analysed using SPSS version 15.
Results: The total mean score of participating paediatricians in the questionnaire was 20.34 (±2.43 SD) out of a total possible score of 23. Approximately two-thirds (65%) of paediatricians scored more or equal to the mean score. The knowledge gap was found to be higher with symptoms of repetitive behaviour patterns, concept of autism, and comorbidity, with no statistical significance. There were no differences in paediatrician scores within different socio-demographic groups. Just under two-thirds (64%) of paediatricians subscribed to the opinion that their own knowledge about autism is limited, and there is a significant lack of knowledge about facilities in every region.
Conclusions: There is a sufficient level of knowledge about autism among paediatricians in tertiary healthcare, although a lack of awareness about the management of these patients, with poor coordination between the different specialists that are involved in their treatment.

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Efforts should focus on achieving a better coordination between these specialists, and update the knowledge gaps identified.

PALABRAS CLAVE
Trastorno autístico;
Conocimiento;
Encuesta de salud;
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Terapéutica

Nivel formativo sobre trastornos del espectro autista (TEA) entre los pediatras de atención hospitalaria

Resumen
Introducción: La formación en trastornos del espectro autista (TEA) por parte de los pediatras es esencial para su diagnóstico precoz. Sin embargo, son escasos los estudios que han cuantificado este conocimiento, por lo que el objetivo principal es determinar el nivel formativo sobre TEA entre pediatras de atención hospitalaria en diferentes comunidades e identificar aspectos a mejorar.
Material y métodos: Un total de 157 pediatras de atención hospitalaria de 3 comunidades autónomas completó el cuestionario online sobre TEA, estructurado en 3 partes (sociodemográfico, nivel formativo y opinión). Los datos fueron analizados con SPSS (versión 15).
Resultados: La media ± desviación estándar de puntuaciones en el cuestionario fue 20,34 ± 2,43 (puntuación máxima posible: 23). Un 65% puntúa en todos los dominios igual o superior a la media. Los conceptos menos conocidos son: patrones restringidos de conducta, concepto general TEA y comorbilidades posibles. No hay diferencias estadísticamente significativas en cuanto a las puntuaciones entre diferentes grupos de pediatras según variables sociodemográficas. Un 64% de los pediatras opina que su conocimiento sobre TEA es limitado. Destaca un desconocimiento importante sobre la disponibilidad de recursos, presente en todas las comunidades estudiadas.
Conclusiones: Existe un adecuado nivel general de conocimientos sobre TEA entre los pediatras, pero un deficiente conocimiento en la parte práctica del manejo de estos pacientes y en la coordinación entre los diferentes equipos que participan en el cuidado de estos. Los esfuerzos deberían centrarse en lograr una buena comunicación entre estos equipos y en mantener actualizados los conocimientos sobre TEA a todos los niveles.

Introduction

Autism spectrum disorders (ASDs) are biologically-based disorders characterised by abnormalities in two domains: social communication/interaction and the presence of stereotypic and repetitive patterns of interest and behaviour.[1–3] They are usually diagnosed during childhood, so it is essential that paediatricians be knowledgeable of them.[2,3]

In recent years, the concepts of autism and Asperger syndrome have been evolving towards what is currently considered a continuous clinical spectrum.[1,4,5] These disorders are difficult to delimit into specific categories, which is consistent with emerging genetic models of ASD that propose the presence of polygenic interactions, polymorphisms, copy number variants and regulation by epigenetic factors. The fifth edition of the Diagnostic and Statistic Manual of Mental Disorders (DSM V) published in May 2013 consolidated the term ASD; it replaced the DSM IV category of pervasive developmental disorders, excludes Rhett syndrome (which is currently considered a specific genetic disorder that happens to have a few overlapping symptoms) and does not differentiate between childhood disintegrative disorder and pervasive developmental disorder not otherwise specified (they are all comprehended in the term ASD).[1,4,5]

The diagnosis of ASD is essentially clinical and based on the presence of persistent deficits in social communication and interaction and restrictive, repetitive and stereotypic patterns of behaviour, interest or activity, hyper/hyporreactivity to sensory input or unusual interest in sensory aspects of the environment.[1,5] The symptoms must be present since early childhood, although they may be undetected until social demands exceed the restricted capabilities of the child. In addition, the most novel aspect introduced by the DSM V is a dimensional measure of severity based on levels of functioning that can be used to determine the position of the individual within the continuous spectrum.[1,4,5]

The prevalence of this group of disorders has been increasing in recent years, and they are also frequently associated to other diseases and mental illnesses.[2,6–9]

Although at present there is widespread awareness of the importance of early diagnosis[1–3,7,9–13] and ASD is a frequent reason for seeking paediatric care both in primary care and hospital settings, paediatricians have different

Table 1 List of studies on the knowledge of health care workers about autism spectrum disorders published to date.

Research team	Year published	Country	Population with autism spectrum disorders	No. of health professionals under study	Type of professionals studied	Salient findings
Zerbo et al.[9]	2015	USA	Adults	922	Physicians, psychologists, social workers, nurses	Adequate level of symptom recognition/lack of training and education
Bakare et al.[12,13]	2008, 2009	Nigeria	Children	134	Health care workers in tertiary care settings	Low-level knowledge of symptoms/greater training in psychiatrists
Garg et al.[10]	2014	Australia	Children	734	Family physicians	Variability in physicians' self-perceived skills/age of doctor, personal interest in ASD and country of graduation are relevant factors
Golnik et al.[7]	2009	USA	Children	539	Family physicians and primary care paediatricians	Need for more training and improvement of primary care
Hartley-McAndrew et al.[2]	2014	USA	Children	280	Doctors, nurses, speech therapists, occupational therapists, physical therapists and teachers	Knowledge on symptoms and diagnosis below recommended level
Khanna and Jariwala[8]	2012	USA	Children	147	Pharmacists	Lack of general knowledge on autism/need for more thorough training
Rahbar et al.[17]	2011	Pakistan	Children	348	General practitioners	Lack of training on symptoms and diagnosis/better training in younger physicians
Igwe et al[19]	2011	Nigeria	Children	80	Paediatric and psychiatric nurses	Gaps in general knowledge about autism/lack of training
Imran et al.[11]	2011	Pakistan	Children	240	Psychiatrists, paediatricians, neurologists, family physicians, psychologists, speech therapists	Better detection of ASD symptoms among non-medical providers/lack of training
Heidgerken et al.[18]	2005	USA	Children	111	Psychiatrists, speech therapists, psychologists, family physicians, paediatricians, neurologists	Adequate and accurate knowledge of DSM IV criteria
Bruder et al[20]	2012	USA	Adults	346	Family physicians	Lack of training on autism in adults
Eseigbe et al.[21]	2015	Nigeria	Children	175	Paediatricians, psychiatrists, general practitioners	Adequate knowledge in paediatricians and psychiatrists in tertiary level hospitals/low-level knowledge in general practitioners

levels of knowledge of ASD, and this can lead to feeling of helplessness in both health care providers and the families of patients that seek care after detecting warning signs.[3,7,9,10,12–21] Furthermore, few studies have measured this knowledge among paediatricians in Spain (a few studies have been published in other countries, some of them even in the adult population, and assessing general knowledge about ASD in different health care settings[12,13]). Table 1 lists the studies published to date on the knowledge of ASD in different types of health care workers and different subsets of patients. Overall, these studies have reported an inadequate training on ASD, an incomplete knowledge of the possible diagnoses, and a lack of competence in the management of children with ASD in individual practitioners.[2,6,10,12,17–21] To date, there are few published studies that focus solely on the training level of paediatricians, and as far as we know, none such study has been published in Spain.

For all of the above, the main objectives of this study were:

1. To determine the level of knowledge about ASD of hospital-based paediatricians in different regions of Spain (Autonomous Community of Valencia, Community of Madrid and Region of Murcia).
2. To determine how hospital-based paediatricians perceive their own knowledge of ASD.
3. To learn the opinion of hospital-based paediatricians regarding the availability of information on the diagnosis and management of these patients.
4. To determine the main changes needed in the educational curriculum to contribute to improving the knowledge of paediatricians and to the early detection of ASD in each region under study.

Materials and methods

We made a brief questionnaire available to paediatricians (adjunct physicians and residents) working in various Spanish hospitals distributed through three autonomous communities: Autonomous Community of Valencia, Community of Madrid and Region of Murcia (Table 2).

The questionnaire was structured based on the study objectives, taking into account the DSM V diagnostic criteria for ASD and comparing our questions with items used in similar studies in the literature. As has been done in other studies,[13] we structured the questionnaire into three parts (Appendix B1–3):

Table 2 Sociodemographic variables of participating paediatricians.

Sociodemographic variables	*N* (%) = 139 (100%)
Age group (years)	
20–29	51 (36.6)
30–39	47 (33.8)
40–49	13 (9.3)
50 or more	28 (20.1)
Sex M/F	37 (26.6)/102 (73.3)
Paediatric specialty	
Paediatrics resident	55 (39.5)
General Paediatrics Adjunct physician	27 (19.4)
Paediatric Neurology Adjunct physician	10 (7.2)
Adjunct physician in a different paediatric specialty	47 (33.8)
Years of experience in Paediatrics	
1–5 years	70 (50.3)
6–10 years	20 (14.3)
11–15 years	17 (12.2)
16–19 years	4 (2.8)
20 years or more	28 (20.2)
Previous work experience with ASD patients	Yes, 59 (42)/no, 80 (58)
Hospital employing respondent	
Hospital Clínico Universitario Virgen de la Arrixaca (Murcia, general hospital)	59 (42)
Hospital Universitario de Móstoles (Madrid, secondary care level)	31 (22.3)
Hospital General Universitario Santa Lucía (Cartagena, Murcia, secondary care level)	6 (4.3)
Hospital Rafael Méndez (Lorca, Murcia, secondary care)	2 (1.43)
Hospital Nisa 9 de Octubre (Valencia, secondary care level)	1 (0.71)
Hospital Universitario Infanta Leonor (Vallecas, Madrid, secondary care level)	17 (12.2)
Hospital General Universitario de Elche (Alicante, secondary care level)	10 (7.19)
Hospital Universitario de Torrevieja (Alicante, secondary care level)	7 (5.03)
Hospital Universitario del Vinalopó (Alicante, secondary care level)	2 (1.43)
Hospital General Universitario de Alicante (general hospital)	1 (0.71)
Hospital Público de Sagunto (secondary care level)	3 (2.15)

1. Sociodemographic (SDASD questionnaire): includes demographic data of participating paediatricians, including sex, age, paediatric specialty, years of professional experience, prior experience with ASD patients, and hospital in which they worked.
2. Knowledge about ASD (KASD questionnaire): further divided into four domains with questions assessing the general knowledge of health care workers about ASD.
3. Opinion on the currently available care for patients with ASD (OASD questionnaire): questions to explore the opinion of health care workers regarding the availability of information on the diagnosis and management of these patients, as well as the training of specialists, in their particular geographical regions.

We administered the questionnaire using Google Forms, which allowed paediatricians to complete them online and submit them directly to the author. We sent the link to the online questionnaire to all professionals that agreed to participate, emphasising that they did not need to consult any educational materials before completing it.

We analysed the data using the Google Forms tools and SPSS version 15. We calculated the mean, median and mode for the total sample for the items in the KASD questionnaires, and compared sociodemographic data by means of ANOVA to assess the association between the knowledge of ASD and the different sociodemographic variables. We also calculated the absolute frequency and percentage of the different opinions assessed in the OASD questionnaire.

Results

A total of 139 paediatricians completed the questionnaire and were included in the study. Seventy-three percent were female, and the highest proportion corresponded to the 20-to-29 years age group, followed closely by the 30-to-39 years group. Consequently, most of the paediatricians (39%) were Paediatrics residents-in-training (MIR). We ought to highlight that 58% of the surveyed paediatricians reported having no past experience with patients with ASD. Table 2 summarises the rest of the sociodemographic variables.

Questionnaire on the knowledge of autism spectrum disorders: description of the survey results

- Domain 1 (knowledge about deficits in social interaction and communication): our results showed adequate knowledge, with paediatricians answering a mean of 92% of questions correctly. The areas with the most errors had to do with the difficulty engaging in joint pretend play (22 incorrect answers) and the belief that all patients with ASD will have language impairments (9 incorrect answers).
- Domain 2 (restrictive or repetitive patterns of behaviour): the percentage of correct answers was lower in this domain (mean, 86%). The aspects paediatricians were most knowledgeable of were the presence of stereotypic movements or the repetitive use of objects/language (94% answered correctly) and the presence of very restricted interests (91% answered correctly). However, the percentage that answered correctly declined to 81%, 82% and 85%, respectively, when it came to the aversive responses to specific sounds or textures (25 answered incorrectly), hyper/hyporreactivity to sensory inputs (24 answered incorrectly) or inflexible adherence to routines (19 answered incorrectly).
- Domain 3 (other features that inform the diagnosis): 19% of paediatricians answered incorrectly when asked about the onset of symptoms in patients with ASD.
- Domain 4 (which examined finer details of the definition of ASD and the presence of comorbidities): the domain in which paediatricians had the largest percentage of incorrect answers corresponded to questions regarding comorbidities (potential association or lack thereof with intellectual disability or epilepsy), as well as the concept of neurodevelopmental disorder (44% of paediatricians did not define ASD as such). However, a high percentage answered correctly (95%–98%) when it came to differentiating autism from schizophrenia and regarding the importance of early diagnosis of patients with ASD and it being essentially a clinical diagnosis.

Features of the distribution of the scores obtained in the questionnaire on autism spectrum disorders

The highest possible score of the KASD was 23 (9, 5, 2 and 7 for each domain, respectively) and the lowest possible score was 0.

The mean $\pm$ standard deviation of the scores obtained by participating paediatricians was 20.34 ± 2.43, the median was 21 and the mode 23. Table 3 shows the mean scores obtained in each of the domains.

Correlation between knowledge of autism spectrum disorders and sociodemographic characteristics of paediatricians (Table 4)

We did not find significant differences in the mean score of the KASD based on any of the sociodemographic variables under study. We found the highest difference between the scores of Paediatric Neurology adjunct physicians (21.2 ± 2.17) and those of residents in Paediatrics (19.70 ± 6.28), but it was not statistically significant ($P = .20$) (Table 4).

Questionnaire on the opinion regarding the care currently available for patients with ASD: description of the survey results

Below, Table 5 summarises the answers given by paediatricians regarding their perception of their own knowledge of ASD and the resources available in their regions.

As the table shows, 64% of paediatricians believed their own knowledge of ASD was limited, and that they did not have sufficient information or resources to diagnose ASD early. Nearly all paediatricians stated that there should be more training on ASD during the residency period or in subsequent years, and when it came to how it should be delivered, the preferred options were: rotations in Paediatric Neurology/Psychiatry, rotations in early intervention centres, and

Table 3 Mean score by domain.

Domains	Knowledge area	Total possible score	Score mean ± SD	*N* (%) of paediatricians that scored at or above the mean
Domain 1	Deficits in social interaction and communication	9	8.23 ± 1.03	110 (80)
Domains 2	Restrictive or repetitive patterns of behaviour	5	4.36 ± 0.93	112 (80)
Domain 3	Other features used in diagnosis	2	1.71 ± 0.52	103 (74)
Domain 4	Definition of ASD, comorbidities	7	6 ± 1.12	104 (74)
Full questionnaire		23	20.34 ± 2.43	91 (65)

the availability of protocols for ASD screening and the management of these patients.

We ought to highlight the lack of knowledge regarding the available resources, as 48% of paediatricians did not know whether there was a specific protocol for referral and followup in their region, and 36% reported not knowing whether adequate multidisciplinary care was available for these patients (25% of respondents answered that they believed that it was not available).

As for the two questions regarding the resources available in each region, Table 5 shows the distribution of the answers by autonomous community. The most salient finding was that Murcia was the autonomous community in which the highest percentage of paediatricians reported that such treatment was available (45%), although a similar percentage (40%) answered that they did not know. In the Autonomous Community of Valencia, 45% of respondents answered that multidisciplinary treatment was not

Table 4 Correlation between scores and sociodemographic variables.

Sociodemographic variables	Mean KASD score	ANOVA (one-way)
Age group		
20–29 years	19.5 ± 7.0	*F*-ratio: 1.55; df, 3
30–39 years	20.65 ± 4.62	*P* = .20
40–49 years	20.23 ± 4.52	
50 years or more	20.25 ± 7.75	
Sex		
Female	20.15 ± 5.77	*F*-ratio: 0.01; df, 1
Male	20.22 ± 7.37	*P* = .89
Specialty		
Paediatrics resident	19.70 ± 6.28	*F*-ratio: 1.55; df, 3
Adjunct in general paediatrics	20.62 ± 6.31	*P* = .20
Adjunct in paediatric neurology	21.2 ± 2.17	
Adjunct in a different paediatric specialty	20.23 ± 6.44	
Years of experience in paediatrics		
1–5	19.89 ± 6.38	*F*-ratio: 1.20; df, 4
6–10	21.25 ± 2.30	*P* = .31
11–15	20.00 ± 7.25	
16–19	20.50 ± 5.66	
20 or more	20.14 ± 7.46	
Previous professional experience with ASD patients		
Yes	20.25 ± 6.33	*F*-ratio: 0.11; df, 1
No	20.11 ± 6.07	*P* = .73
Autonomous community		
Autonomous Community of Valencia	19.86 ± 5.75	*F*-ratio: 1.27; df, 2
Region of Murcia	19.89 ± 5.98	*P* = .28
Community of Madrid	20.58 ± 6.50	

Table 5 Number and percentages of the different answers of paediatricians regarding their perception of their own knowledge of ASD and the resources available in their region.

	I do not know	Yes	No
Is adequate multidisciplinary management of the social and health care needs of patients with ASD available in your region?	49 (36.3%)	**51 (37.8%)**	35 (25.9%)
Autonomous Community of Valencia	6 (27%)	6 (27%)	10 (45%)
Region of Murcia	24 (40%)	27 (45%)	8 (13%)
Community of Madrid	19 (35%)	18 (33%)	17 (31%)
Do you think you have sufficient training or resources for the early diagnosis of ASD?	–	46 (34.3%)	**88 (65.7%)**
How would you rate your knowledge and skills in the area of ASD?	**Deficient: 87 (64%)**	Sufficient: 39 (28.9%)	Adequate: 9 (6.7%)
Should there be more education on ASD during residency and training activities?		**Yes: 132 (97.8%)**	No: 3 (2.2%)
Is there a specific protocol for the referral and followup of patients with ASD in the region where you work?	**65 (48%)**	50 (37%)	20 (14%)
Autonomous Community of Valencia	4 (18%)	11 (50%)	7 (32%)
Region of Murcia	36 (61%)	20 (34%)	3 (5%)
Community of Madrid	25 (46%)	19 (35%)	10 (18%)

The most frequent answer is displayed in bold face.

available, and this percentage was very similar in Madrid (33%, 31% and 35%, respectively, answered that it was available, was not available, or did not know).

When it came to whether there was a protocol for the referral and followup of patients with ASD in their region, the percentage of paediatricians responding that there was one was highest in the autonomous community of Valencia (50%), while Murcia was the autonomous community where the highest percentage of paediatricians did not know whether there was one (61%), followed by Madrid.

Conclusions

The mean score in the KASD questionnaire of participating paediatricians was 20.34 ± 2.43, while the maximum possible score was 23. Thus, this was a high score that indicated an adequate knowledge of paediatricians about ASD (a total of 91 paediatricians [65%] had a score at or above the mean in every domain).

Although the studies published to date have not focused on the field of paediatrics and have been conducted in other countries, we ought to highlight that the level of knowledge found in our study exceeded those reported in similar works.[12,13]

We found that the main problem areas involved the concept of restrictive or repetitive patterns of behaviour (fewer paediatricians knew about the aversive responses to certain sounds or textures, hyper/hyporreactivity to sensory inputs or inflexible adherence to routines) and in the definition of ASD and the presence of comorbidities, the latter being the question which paediatricians most frequently answered incorrectly. We also ought to highlight that 19% of paediatricians answered the question regarding the onset of symptoms in patients with ASD incorrectly, a particularly relevant aspect given the importance of early diagnosis in these patients.

We did not find noteworthy or statistically significant differences in questionnaire scores between subsets of paediatricians (by age, sex, work title, years of experience etc.), unlike what has been described in other studies.[12,13] We found the greatest difference between the scores of paediatricians working as adjunct physicians in Paediatric Neurology and those of Paediatrics residents, with the former scoring higher, as would be expected, but it was not statistically significant. When it came to the number of years of experience in the field of Paediatrics, the group with six to ten years of experience scored highest, which could be explained by, on one hand, the short time elapsed since the MIR residency training period and, on the other, the years of experience as an adjunct in Paediatrics.

Despite the good results observed in the questionnaire scores, paediatricians generally reported believing that training in ASD was lacking, which is consistent with previous studies on the subject. Sixty-four percent of paediatricians stated that their own knowledge of ASD was limited and that they did not have sufficient training or resources for the early diagnosis of ASD.[7,10,12–16] Most considered that education on ASD should be expanded during residency or in subsequent years. Another important finding was that there was a considerable lack of knowledge as to the available resources in the different regions under study, which probably contributes to the feelings of insecurity and lack of control in the management of these patients. We found this lack of knowledge in every autonomous community under study, and the prevailing response of paediatricians as to whether there was a protocol for the referral or the specialised management of patients with ASD was either that there was none, or that they did not know.

According to the data presented above, paediatricians have an adequate general knowledge of ASD, but there are

deficiencies in their knowledge about the management of these patients and in the coordination between the different multidisciplinary teams that participate in the care of these patients, which lead to incomplete and deficient care delivery in these patients. Thus, future efforts should focus on achieving adequate communication between these teams (paediatricians, educational institutions, administrations, early intervention) and in keeping the knowledge of ASD updated in order to develop a well-organised system to provide expeditious, efficient and—to the degree possible—convenient care for children with ASD and their families.

Conflict of interests

The authors have no conflict of interests to declare.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.anpede.2016.05.007.

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